

In this manner, the connection of the relay chamber block BD to the rear of the action block BC is completed. Thereafter, the end face OF of the action block BC whereat discharge orifices OR are installed is polished by the use of polishing sand (#1000 or more) so as to form a smooth surface. Subsequently, cleaning is effected to remove any polishing sand and unnecessary materials which have entered into the grooves LV through the orifices OR during the polishing. Whether or not the end face OF has become a completely flat surface and whether or not the interior of the grooves LV has been completely cleaned is checked up and, when the polishing is incomplete, the end face OF is re-polished and subsequently cleaning is effected. A similar check-up is effected and, when the result of the check-up is "No", this step is repeated and, when there is no defect, the assembly of the block BC and the block BD is dried.

Further, the completed head is joined to an aluminum plate and the lead electrodes are connected to a flexible wiring plate.

A specific example of the ink jet recording effected by the use of the thus obtained recording head will now be described by reference to FIG. 12. In FIG. 12, for convenience of illustration, the various component blocks are shown as being separated from one another. Actually, however, the various components and blocks are of course made integral with one another by cementing, as described above. In this shown example, recording ink is first introduced into each long grooves LV through the components BH and BH'. Next, when an electrical pulse signal is applied to the heat generating resistor, not shown, there is generated a thermal pulse and as a result, the ink is momentarily gasified. By the bubble created by this gasification, a pressure wave (action force) is applied to the ink, as a result of which the ink discharges and flies in the form of substantially uniform droplets through the orifices OR communicated with the grooves LV and these droplets adhere to the recording member, not shown, thereby accomplishing the recording.

When an experiment of ink discharge by the six recording heads completed as described above has been actually carried out by the use of ink of the following composition under the experimental conditions as mentioned below, stable discharge of ink droplets has taken place over 109 times or more in any of these recording heads and the dots obtained have been substantially uniform. The discharge speeds of the ink droplets have been as shown in the table below.

Water		70 parts by weight			
Diethyleneglycol		29 parts by weight			
Black dye		1 part by weight			
Recording head		Applied pulse conditions			Ink droplet
No.	D(l <sub>4</sub> in component PB)	Vbltage	Pulse width	Frequency	discharge speed (unit: m/sec.)
1	80 μm	40 V	10 μsec.	10 KHz	1.3
2	150 μm				1.5
3	350 μm				2.0
4	800 μm				3.2
5	1500 μm				3.6
6	2500 μm				1.9

As has been described above in detail, according to the droplet forming apparatus shown in the embodiment, there can be provided an ink jet recording apparatus in which the responsiveness of ink droplet discharge to the information signal input and the discharge state of ink droplets are very

good and the output level is high so that record images of good quality can be provided at high speed.

Although not shown, the droplet forming apparatus of the present invention described above in detail may of course be modified into a multi-orifice array type to sufficiently achieve the aforementioned objects. In this case, the liquid supply to each action chamber may be effected through a common liquid supply chamber communicated with the liquid introduction port of each of a plurality of action chambers.

What we claim is:

1. A process for producing a substrate for an ink jet recording head comprising a plurality of discharge openings for discharging a liquid and a plurality of liquid passageways each communicating with one of the plurality of discharge openings, the process comprising the steps of:

forming in a predetermined pattern on a base plate a plurality of heat generating resistance members arranged generally along a line and a plurality of pairs of electrodes each connected to one of the plurality of heat generating resistance members, wherein each said pair of electrodes and each corresponding heat generating resistance member integrally form a U-shaped wiring member with a bent portion arranged with all of said bent portions facing in the same direction; and

cutting the base plate along a line substantially parallel to said line along which the plurality of heat generating resistance members are arranged at a location remote by a predetermined distance from each of the plurality of heat generating resistance members to form the substrate, the location for cutting determining a relative location between the plurality of heat generating resistance members and the plurality of discharge openings of the ink jet recording head to be produced using the substrate.

2. A process for producing an ink jet recording head comprising a plurality of discharge openings for discharging a liquid and a plurality of liquid passageways each communicating with one of the plurality of discharge openings, the process comprising the steps of:

forming in a predetermined pattern on a base plate a plurality of heat generating resistance members arranged generally along a line and a plurality of pairs of electrodes each connected to one of the plurality of heat generating resistance members, wherein each said pair of electrodes and each corresponding heat generating resistance member integrally form a U-shaped wiring member with a bent portion arranged with all of said bent portions facing in the same direction;

cutting the base plate along a line substantially parallel to said line along which the plurality of heat generating resistance members are arranged at a location remote by a predetermined distance from each of the plurality of heat generating resistance members to form a substrate for the ink jet recording head, the location for cutting determining a relative location between the plurality of heat generating resistance members and the plurality of discharge openings of the ink jet recording head to be produced using the substrate; and

attaching a liquid passageway forming member onto the substrate, whereby a plurality of liquid passageways are formed each corresponding to one of the U-shaped wiring members.

3. The process according to claim 2, wherein the end portions of the plurality of liquid passageways are formed corresponding to the end portion of the base plate.

11

✓ 4. An ink jet recording head comprising a plurality of discharge openings for discharging a liquid and a plurality of liquid passageways each communicating with one of the plurality of discharge openings, the ink jet recording head being produced by a production process comprising the steps of:

forming in a predetermined pattern on a base plate a plurality of heat generating resistance members arranged generally along a line and a plurality of pairs of electrodes each connected to one of the plurality of heat generating resistance members, wherein each said pair of electrodes and each corresponding heat generating resistance member integrally form a U-shaped wiring member with a bent portion arranged with all of said bent portions facing in the same direction;

cutting the base plate along a line substantially parallel to said line along which the plurality of heat generating resistance members are arranged at a location remote by a predetermined distance from each of the plurality of heat generating resistance members to form a substrate for the ink jet recording head having a cut end portion, the location for cutting determining a relative location between the plurality of heat generating resistance members and the plurality of discharge openings of the ink jet recording head to be produced using the substrate; and

attaching a liquid passageway forming member onto the substrate, whereby a plurality of liquid passageways are formed each corresponding to one of the U-shaped wiring members,

wherein the end portions of the plurality of liquid passageways are formed corresponding to the cut end portion of the substrate.

✓ 5. An ink jet recording apparatus comprising an ink jet recording head comprising a plurality of discharge openings

12

for discharging a liquid and a plurality of liquid passageways each communicating with one of the plurality of discharge openings, and means for supplying electric power to the ink jet recording head, the ink jet recording head being produced by a production process comprising the steps of:

forming in a predetermined pattern on a base plate a plurality of heat generating resistance members arranged generally along a line and a plurality of pairs of electrodes each connected to one of the plurality of heat generating resistance members, wherein each said pair of electrodes and each corresponding heat generating resistance member integrally form a U-shaped wiring member with a bent portion arranged with all of said bent portions facing in the same direction;

cutting the base plate along a line substantially parallel to said line along which the plurality of heat generating resistance members are arranged at a location remote by a predetermined distance from each of the plurality of heat generating resistance members to form a substrate for the ink jet recording head having a cut end portion, the location for cutting determining a relative location between the plurality of heat generating resistance members and the plurality of discharge openings of the ink jet recording head to be produced using the substrate; and

attaching a liquid passageway forming member onto the substrate, whereby a plurality of liquid passageways are formed each corresponding to one of the U-shaped wiring members,

wherein the end portions of the plurality of liquid passageways are formed corresponding to the cut end portion of the substrate.

\* \* \* \* \*

✓ 6. A process according to Claim 1, wherein each heat generating resistance member is a planar member having a longer side extending along the liquid passageway and a shorter side orthogonal to the liquid passageway, with the longer side having a length at least two times as long as the length of the shorter side.

✓ 7. A process according to Claim 1, wherein each said pair of electrodes and each corresponding heat generating resistance member are laminated in layers.

✓ 8. A process according to Claim 2, wherein each heat generating resistance member is a planar member having a longer side extending along the liquid passageway and a shorter side orthogonal to the liquid passageway, with the longer side having a length at least two times as long as the length of said shorter side.

✓ 9. A process according to Claim 2, wherein each said pair of electrodes and each corresponding heat generating resistance member are laminated in layers.

✓ 10. An ink jet recording head according to Claim 4, wherein each heat generating resistance member is a planar member having a longer side extending along the liquid passageway and a shorter side orthogonal to the liquid passageway, with the longer side having a length at least two times as long as the length of the shorter side.

✓ 11. An ink jet recording head according to Claim 4, wherein each said pair of electrodes and each corresponding heat generating resistance member are laminated in layers.

✓ 12. An ink jet recording apparatus according to Claim 5, wherein each heat generating resistance member is a planar member having a longer side extending along the liquid passageway and a shorter side orthogonal to the liquid passageway, with the longer side having a length at least two times as long as the length of the shorter side.

✓ 13. An ink jet recording apparatus according to Claim 5, wherein each said pair of electrodes and each corresponding heat generating resistance member are laminated in layers.

14. A process for producing a substrate for an ink jet recording head comprising a plurality of discharge openings for discharging a liquid and a plurality of liquid passageways, each communicating with one of the plurality of discharge openings, the process comprising the steps of:

forming in a predetermined pattern on a base plate a plurality of heat generating resistance members arranged generally along a line and a plurality of electrodes, including at least one selective electrode and at least one ground electrode, with each of the plurality of heat generating resistance members being connected to a selective electrode and a ground electrode, wherein each heat generating resistance member and corresponding selective and ground electrodes integrally form a U-shaped conductive path with each U-shaped conductive path facing in the same direction, and each heat generating resistance member being a planar member having a longer side extending along the liquid passageway and a shorter side orthogonal to the

liquid passageway, with the longer side having a length at least two times as long as the length of the shorter side; and

cutting the base plate along a line substantially parallel to the line along which the plurality of heat generating resistance members are arranged at a location remote by a predetermined distance from each of the plurality of heat generating resistance members to form the substrate, the location for cutting determining a relative location between the plurality of heat generating resistance members and the plurality of discharge openings of the ink jet recording head to be produced using the substrate.

15. A process for producing an ink jet recording head comprising a plurality of discharge openings for discharging a liquid and a plurality of liquid passageways each communicating with one of the plurality of discharge openings, the process comprising the steps of:

forming in a predetermined pattern on a base plate a plurality of heat generating resistance members arranged generally along a line and a plurality of electrodes including at least one selective electrode and at least one ground electrode, with each of the plurality of heat generating resistance members being connected to a selective electrode and a ground electrode, wherein each heat generating resistance member and corresponding selective and ground electrodes integrally form a U-shaped conductive path with each U-shaped conductive path facing in the same direction, and each heat generating resistance member being a planar member having a longer side extending along the liquid passageway and a shorter side orthogonal to the liquid passageway, with the longer side having a length at least two times as long as the length of the shorter side;

cutting the base plate along a line substantially parallel to said line along which the plurality of heat generating resistance members are arranged at a location remote by a predetermined distance from each of the plurality of heat generating resistance members to form a substrate for the ink jet recording head, the location for cutting determining a relative location between the plurality of heat generating resistance members and the plurality of discharge openings of the ink jet recording head to be produced using the substrate; and

attaching a liquid passageway forming member onto the substrate, whereby a plurality of liquid passageways are formed corresponding to the U-shaped conductive paths.

16. An ink jet recording head comprising a plurality of discharge openings for discharging a liquid and a plurality of liquid passageways each communicating with one of the plurality of discharge openings, the ink jet recording head being produced by a production process comprising the steps of:

forming in a predetermined pattern on a base plate a plurality of heat generating resistance members arranged generally along a line and a plurality of electrodes including at least one selective electrode and at least one ground electrode, with each of the plurality of heat generating resistance members being connected to a selective electrode and a ground electrode, wherein each heat generating resistance member and corresponding selective and ground electrodes integrally form a U-shaped conductive path with each U-shaped conductive path facing in the same direction, and each heat generating resistance member being a planar member having a longer side extending along the liquid passageway and a shorter side orthogonal to the liquid passageway, with the longer side having a length at least two times as long as the length of the shorter side;

cutting the base plate along a line substantially parallel to said line along which the plurality of heat generating resistance members are arranged at a location remote by a predetermined distance from each of the plurality of heat generating resistance members to form a substrate for the ink jet recording head having a cut end portion, the location for cutting determining a relative location between the plurality of heat generating resistance members and the plurality of discharge openings of the ink jet recording head to be produced using the substrate; and

attaching a liquid passageway forming member onto the substrate, whereby a plurality of liquid passageways are formed each corresponding to one of the U-shaped conductive portions,

wherein the end portions of the plurality of liquid passageways are formed corresponding to the cut end portion of the substrate.

17. An ink jet recording apparatus comprising an ink jet recording head comprising a plurality of discharge openings for discharging a liquid and a plurality of liquid passageways each communicating with one of the plurality of discharge openings, and a controller for supplying electric power to the ink jet recording head, the ink jet recording head being produced by a production process comprising the steps of:

forming in a predetermined pattern on a base plate a plurality of heat generating resistance members arranged generally along a line and a plurality of electrodes including at least one selective electrode and at least one ground electrode, with each of the plurality of heat generating resistance members being connected to a selective electrode and a ground electrode, wherein each heat generating resistance member and corresponding selective and ground electrodes integrally form a U-shaped conductive path with each U-shaped conductive path

facing in the same direction, and each heat generating resistance member being a planar member having a longer side extending along the liquid passageway and a shorter side orthogonal to the liquid passageway, with the longer side having a length at least two times as long as the length of the shorter side;

cutting the base plate along a line substantially parallel to said line along which the plurality of heat generating resistance members are arranged at a location remote by a predetermined distance from each of the plurality of heat generating resistance members to form a substrate for the ink jet recording head having a cut end portion, the location for cutting determining a relative location between the plurality of heat generating resistance members and the plurality of discharge openings of the ink jet recording head to be produced using the substrate; and

attaching a liquid passageway forming member onto the substrate, whereby a plurality of liquid passageways are formed corresponding to the U-shaped conductive paths, wherein the end portions of the plurality of liquid passageways are formed corresponding to the cut end portion of the substrate.

18. A process for producing a substrate for an ink jet recording head comprising a plurality of discharge openings for discharging a liquid and a plurality of liquid passageways, each communicating with one of the plurality of discharge openings, the process comprising the steps of:

forming in a predetermined pattern on a base plate a plurality of heat generating resistance members arranged generally along a line and a plurality of electrodes, including at least one selective electrode and at least one ground electrode, with each of the plurality of heat generating resistance members being connected to a selective electrode and a ground electrode,



wherein each heat generating resistance member and corresponding selective and ground electrodes integrally form a U-shaped conductive path with each U-shaped conductive path facing in the same direction, and each selective electrode, ground electrode and corresponding heat generating resistance member are laminated in at least two layers; and

cutting the base plate along a line substantially parallel to the line along which the plurality of heat generating resistance members are arranged at a location remote by a predetermined distance from each of the plurality of heat generating resistance members to form the substrate, the location for cutting determining a relative location between the plurality of heat generating resistance members and the plurality of discharge openings of the ink jet recording head to be produced using the substrate.

19. A process for producing an ink jet recording head comprising a plurality of discharge openings for discharging a liquid and a plurality of liquid passageways each communicating with one of the plurality of discharge openings, the process comprising the steps of:

forming in a predetermined pattern on a base plate a plurality of heat generating resistance members arranged generally along a line and a plurality of electrodes including at least one selective electrode and at least one ground electrode, with each of the plurality of heat generating resistance members being connected to a selective electrode and a ground electrode, wherein each heat generating resistance member and corresponding selective and ground electrodes integrally form a U-shaped conductive path with each U-shaped conductive path facing in the same direction, and each selective electrode, ground electrode and corresponding heat generating resistance member are laminated in at least two layers;

cutting the base plate along a line substantially parallel to said line along which the plurality of heat generating resistance members are arranged at a location remote by a predetermined distance from each of the plurality of heat generating resistance members to form a substrate for the ink jet recording head, the location for cutting determining a relative location between the plurality of heat generating resistance members and the plurality of discharge openings of the ink jet recording head to be produced using the substrate; and

attaching a liquid passageway forming member onto the substrate, whereby a plurality of liquid passageways are formed corresponding to the U-shaped conductive paths.

20. An ink jet recording head comprising a plurality of discharge openings for discharging a liquid and a plurality of liquid passageways each communicating with one of the plurality of discharge openings, the ink jet recording head being produced by a production process comprising the steps of:

forming in a predetermined pattern on a base plate a plurality of heat generating resistance members arranged generally along a line and a plurality of electrodes including at least one selective electrode and at least one ground electrode, with each of the plurality of heat generating resistance members being connected to a selective electrode and a ground electrode, wherein each heat generating resistance member and corresponding selective and ground electrodes integrally form a U-shaped conductive path with each U-shaped conductive path facing in the same direction, and each selective electrode, ground electrode and corresponding heat generating resistance member are laminated in at least two layers;

cutting the base plate along a line substantially parallel to said line along which the plurality of heat generating resistance members are arranged at a location remote by a predetermined distance from each of the plurality of heat generating resistance members to form

a substrate for the ink jet recording head having a cut end portion, the location for cutting determining a relative location between the plurality of heat generating resistance members and the plurality of discharge openings of the ink jet recording head to be produced using the substrate; and

attaching a liquid passageway forming member onto the substrate, whereby a plurality of liquid passageways are formed corresponding to the U-shaped conductive portions, wherein the end portions of the plurality of liquid passageways are formed corresponding to the cut end portion of the substrate.

21. An ink jet recording apparatus comprising an ink jet recording head comprising a plurality of discharge openings for discharging a liquid and a plurality of liquid passageways each communicating with one of the plurality of discharge openings, and a controller for supplying electric power to the ink jet recording head, the ink jet recording head being produced by a production process comprising the steps of:

forming in a predetermined pattern on a base plate a plurality of heat generating resistance members arranged generally along a line and a plurality of electrodes including at least one selective electrode and at least one ground electrode, with each of the plurality of heat generating resistance members being connected to a selective electrode and a ground electrode, wherein each heat generating resistance member and corresponding selective and ground electrodes integrally form a U-shaped conductive path with each U-shaped conductive path facing in the same direction, and each selective electrode, ground electrode and corresponding heat generating resistance member are laminated in at least two layers;

cutting the base plate along a line substantially parallel to said line along which the plurality of heat generating resistance members are arranged at a location remote by a predetermined distance from each of the plurality of heat generating resistance members to form a substrate for the ink jet recording head having a cut end portion, the location for cutting determining a relative location between the plurality of heat generating resistance members and the plurality of discharge openings of the ink jet recording head to be produced using the substrate; and

attaching a liquid passageway forming member onto the substrate, whereby a plurality of liquid passageways are formed corresponding to the U-shaped conductive paths, wherein the end portions of the plurality of liquid passageways are formed corresponding to the cut end portion of the substrate.

22. A process for producing a substrate for an ink jet recording head comprising a plurality of discharge openings for discharging a liquid and a plurality of liquid passageways each communicating with one of the plurality of discharge openings, the process comprising the steps of:

forming in a predetermined pattern on a base plate a plurality of heat generating resistance members arranged generally along a line and a plurality of pairs of electrodes each connected to one of the plurality of heat generating resistance members, wherein each said pair of electrodes and each corresponding heat generating resistance member integrally form a U-shaped conductive path with a bent portion arranged with all of said bent portions facing in the same direction, wherein each said pair of electrodes and each corresponding heat generating resistance member are laminated in layers; and

cutting the base plate along a line substantially parallel to said line along which the plurality of heat generating resistance members are arranged at a location remote by a predetermined distance from each of the plurality of heat generating resistance members to form the substrate, the location for cutting determining a relative location between the plurality of heat generating resistance members and the plurality of discharge openings of the ink jet recording head to be produced using the substrate.

23. A process for producing an ink jet recording head comprising a plurality of discharge openings for discharging a liquid and a plurality of liquid passageways each communicating with one of the plurality of discharge openings, the process comprising the steps of:

forming in a predetermined pattern on a base plate a plurality of heat generating resistance members arranged generally along a line and a plurality of pairs of electrodes each connected to one of the plurality of heat generating resistance members, wherein each said pair of electrodes and each corresponding heat generating resistance member integrally form a U-shaped conductive path with a bent portion arranged with all of said bent portions facing in the same direction, wherein each said pair of electrodes and each corresponding heat generating resistance member are laminated in layers;

cutting the base plate along a line substantially parallel to said line along which the plurality of heat generating resistance members are arranged at a location remote by a predetermined distance from each of the plurality of heat generating resistance members to form a substrate for the ink jet recording head, the location for cutting determining a relative location between the plurality of heat generating resistance members and the plurality of discharge openings of the ink jet recording head to be produced using the substrate; and

attaching a liquid passageway forming member onto the substrate, whereby a plurality of liquid passageways are formed corresponding to the U-shaped conductive paths.

24. An ink jet recording head comprising a plurality of discharge openings for discharging a liquid and a plurality of liquid passageways each communicating with one of the plurality of discharge openings, the ink jet recording head being produced by a production process comprising the steps of:

forming in a predetermined pattern on a base plate a plurality of heat generating resistance members arranged generally along a line and a plurality of pairs of electrodes each connected to one of the plurality of heat generating resistance members, wherein each said pair of electrodes and each corresponding heat generating resistance member integrally form a U-shaped conductive path with a bent portion arranged with all of said bent portions facing in the same direction, wherein each said pair of electrodes and each corresponding heat generating resistance member are laminated in layers;

cutting the base plate along a line substantially parallel to said line along which the plurality of heat generating resistance members are arranged at a location remote by a predetermined distance from each of the plurality of heat generating resistance members to form a substrate for the ink jet recording head having a cut end portion, the location for cutting determining a relative location between the plurality of heat generating resistance members and the plurality of discharge openings of the ink jet recording head to be produced using the substrate; and

attaching a liquid passageway forming member onto the substrate, whereby a plurality of liquid passageways are formed corresponding to the U-shaped conductive paths.

wherein the end portions of the plurality of liquid passageways are formed corresponding to the cut end portion of the substrate.

25. An ink jet recording apparatus comprising an ink jet recording head comprising a plurality of discharge openings for discharging a liquid and a plurality of liquid passageways each communicating with one of the plurality of discharge openings, and a controller for supplying electric power to the ink jet recording head, the ink jet recording head being produced by a production process comprising the steps of:

forming in a predetermined pattern on a base plate a plurality of heat generating resistance members arranged generally along a line and a plurality of pairs of electrodes each connected to one of the plurality of heat generating resistance members, wherein each said pair of electrodes and each corresponding heat generating resistance member integrally form a U-shaped conductive path with a bent portion arranged with all of said bent portions facing in the same direction, wherein each said pair of electrodes and each corresponding heat generating resistance member are laminated in layers;

cutting the base plate along a line substantially parallel to said line along which the plurality of heat generating resistance members are arranged at a location remote by a predetermined distance from each of the plurality of heat generating resistance members to form a substrate for the ink jet recording head having a cut end portion, the location for cutting determining a relative location between the plurality of heat generating resistance members and the plurality of discharge openings of the ink jet recording head to be produced using the substrate; and

DC\_MAIN 67450 v 1

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398	2399	2400	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411	2412	2413	2414	2415	2416	2417	2418	2419	2420	2421	2422	2
--	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	---